ten years record, Galveston, Tex., nineteen years record, Chattanooga, Tenn., eleven years record, Escanaba, Mich., sixteen years record, and Neah Bay, Wash., five years record, the same as minimum of two or more preceding years. At Fort Klamath, Oregon, five years record, the minimum was the same as that of 1887. In eastern Pennsylvania, southeastern New York, and western Connecticut the lowest temperature reported for August by Signal Service stations was generally noted in 1885; in Maryland and the District of Columbia in 1874; in the upper Ohio valley, south-central Virginia, northern Georgia, southeastern Minnesota, and southwestern Wisconsin in 1887; on the South Carolina and Georgia coasts in 1879; on the middle Gulf coast and in the Rio Grande Valley in 1884; in west-central Minnesota and northwestern Dakota in 1886; and in adjoining parts of Nebraska, Wyoming, and Colorado in 1876. In all other sections the periods of occurrence were irregular.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of miscellaneous meteorological data. The greatest monthly ranges occurred in the lower valley of the Red River of the North, whence they decreased eastward to less than 30° at Erie, Pa., and along the New England and middle Atlantic coasts; southeastward and southward to less than 20° on the North Carolina and east and middle Gulf coasts; and southwestward and westward to less than 30° along the immediate Pacific coast. At Fort Klamath, Oregon, the monthly range exceeded 60°.

The following are some of the extreme monthly ranges:

Greatest.	°	Least.	°
Saint Vincent, Minn	63.0	Hatteras, N. C	17.0
Fort Klamath, Oregon	63.0	Port Eads, La	18.0
Fort Sully, Dak	59.0	Key West, Fla	19.0
Fort Du Chesne, Utah	59.0	Nantucket, Mass	21.0
Wilcox, Ariz	53.0	Eureka, Cal	22.0

FROST.

The following are the only reports of frost injurious to vegetation during August, 1889:

Galena, Ill.: the low grounds in this section were visited by frost on the morning of the 1st, which did considerable damage to vegetables. Tobacco was also severely injured.—*Union and Advertiser, Rochester, N. Y., August 2.*

Grand Rapids, Wis.: this section was visited by severe frost during the night of the 4–5th, which destroyed a great portion of the cranberry crop.—*Milwaukee, Wis., Journal, 6th.*

Linkville, Oregon: heavy frost occurred on the morning of the 19th, causing considerable damage to vegetables.—*Report of Signal Service observer.*

In the preceding month the only report of frost injurious to vegetation was received from the voluntary observer at Coulter, Colo. Reports of preceding years show that heavy frost in the United States is unusual during July and August, and that the first killing frosts generally occur in northeastern Dakota, central and northern Minnesota, and the more northern parts of Wisconsin and Michigan, where their average date of occurrence is about September 1st.

For August, 1889, light frost was reported in New England, New York, northern Pennsylvania, northeastern Ohio, northern Indiana, Michigan, Wisconsin, northeastern Iowa, in the valley of the Red River of the North, north-central Colorado, southwestern Dakota, central Montana, northern and southeastern Idaho, Utah, and Nevada. No frost was reported south of the fortieth parallel in districts lying east of the Rocky Mountains, nor on the Pacific coast, save at Linkville, Oregon.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for August, 1889:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Boston, Mass	66.5	57.0	9.5	62.6	67.4
Canby, Fort, Wash	65.5	55.0	10.5	61.4	57.6
Cedar Keys, Fla	88.7	80.9	7.8	85.6	80.4
Charleston, S. C	84.7	79.0	5.7	81.6	78.0
Eastport, Me	53.0	49.8	3.2	51.5	60.3
Galveston, Tex	88.0	81.0	7.0	85.1	81.5
Key West, Fla	86.2	79.3	6.9	84.5	82.1
Nantucket, Mass	74.5	70.5	4.0	72.7	67.4
New York City	72.4	69.0	3.4	70.0	71.5
Portland, Oregon	77.9	68.0	9.9	71.4	64.8

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for August, 1889, as determined from the reports of nearly 2,000 stations, is exhibited on chart iii. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

In August, 1889, the precipitation was very irregularly distributed and was greatest in areas in extreme southeastern Massachusetts, south-central North Carolina, north-central and south-central Florida, north-central Georgia, and extreme southeastern Nebraska, where it exceeded ten inches, the greatest amounts reported in the several localities referred to being: 11.05, at Nantucket, Mass.; 11.89, at Florence, N. C.; 14.02, at Live Oak, Fla.; 15.56, at Diamond, Ga., and 12.10 at Tecumseh, Nebr. At stations in southeastern New England, southeastern New York, central New Jersey, southeastern Pennsylvania, eastern Virginia, south-central and eastern North Carolina, east-central, southern, north-central, and western Florida, east-central Alabama, southern Mississippi, southeastern Louisiana, along the Texas coast, in northeastern Arkansas, south-central and eastern Tennessee, northeastern Minnesota, southwestern Wisconsin, southwestern Iowa, northeastern Kansas, southeastern Nebraska, north-central and south-central Indian Ter., on the extreme north Pacific coast, and at Curtis, Ariz., the rainfall exceeded five inches. Along the California coast between San Francisco and Los Angeles, and thence northward in the valley of the Sacramento River to northern California, and northeastward to north-central Nevada no precipitation was reported for the month. At stations from the northwest coast of Lake Ontario to the southwest coast of Lake Michigan, in the central Ohio and upper Mississippi valleys, southwestern Arkansas, central and western Texas, the northeastern slope of the Rocky Mountains, the plateau regions, save in areas in the middle and southern plateau, and along the Pacific coast south of the forty-second parallel the precipitation was less than one-half inch.

The precipitation for August, 1889, was generally above the normal from southeastern New York to and along the Saint Lawrence Valley to the Gulf, on the south-central New England coast, in southern Florida, the interior of the south Atlantic and east Gulf states, along the west Gulf coast, in eastern and southwestern Tennessee, eastern Kansas, western Missouri, northern Indian Ter., the southern California

coast, and the Pacific coast north of the fortieth parallel and thence southeastward to northern Utah; elsewhere the precipitation was generally below the normal. The greatest departures above the normal occurred in east-central Georgia, extreme southern Florida, northeastern Minnesota, eastern Kansas, and along the coast of Washington Ter., where they exceeded three inches, and amounted to 4.54 at Key West, Fla., 4.57 at Duluth, Minn., and 4.19 at Neah Bay, Wash. The most marked departures below the normal were noted in eastern Maryland, on the east Gulf coast, in the middle Ohio valley, east-central Iowa, southeastern Dakota, and south-central New Mexico, where they were more than three inches; the greatest deficiency, 3.89, being reported at Mobile, Ala. In districts where the precipitation was in excess the average percentages of the normal were about as follows: Florida Peninsula, 106 per cent.; Rio Grande Valley, 135 per cent.; middle-eastern slope of the Rocky Mountains, 109 per cent.; north Pacific coast, 265 per cent.; middle Pacific coast, 160 per cent. In districts where the precipitation was deficient the average percentages of the normal were about as follows: New England, 92 per cent.; middle Atlantic states, 71 per cent.; south Atlantic states, 94 per cent.; east Gulf states, 91 per cent.; west Gulf states, 85 per cent.; Ohio Valley and Tennessee, 67 per cent.; lower lake region, 38 per cent.; upper lake region, 62 per cent.; extreme northwest, 44 per cent.; upper Mississippi valley, 53 per cent.; Missouri Valley, 80 per cent.; northeastern slope of the Rocky Mountains, 55 per cent.; southeastern slope of the Rocky Mountains, 53 per cent.; southern plateau region, 39 per cent.; middle plateau region, 45 per cent.; northern plateau region, 62 per cent.; middle Pacific coast, 33 per cent.

In the following-named districts the rainfall for July, 1889, was excessive, while for the current month it was deficient: New England, the middle and south Atlantic states, the east and west Gulf states, the upper lake region, upper Mississippi valley, northeastern slope of the Rocky Mountains, and the southern plateau region. In the Florida Peninsula, Rio Grande Valley, middle eastern slope of the Rocky Mountains, and the northern and middle Pacific coast there was a deficiency in July and an excess of rainfall in August, 1889. In the Ohio Valley and Tennessee, the lower lake region, extreme northwest, Missouri Valley, southeastern slope of the Rocky Mountains, the northern and middle plateau regions, and the south Pacific coast the precipitation was below the normal for the current and the preceding month. Among the more notable features of August, 1889, were the great excess of rainfall on the north Pacific coast, where more than two and one-half times the usual amount of rain for August fell, and the marked deficiency in the lower lake region, the southern and middle plateau regions, the northeastern slope of the Rocky Mountains, and the south Pacific coast, where less than one-half the normal amount of rainfall for the month was reported.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for August, 1889; (4) the departure of the current month from the average; (5) and the extreme monthly precipitation for August during the period of observation and the years of occurrence:

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of Aug.	(2) Length of record.	(3) Total for Aug., 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for August.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lead Hill	Boone	6.26	7	4.65	−1.61	11.53	1888	3.91	1886
California.									
Sacramento	Sacramento	T.	39	0.00	— T.	0.08	1864	0.00	*
Colorado.									
Fort Lyon	Bent	1.88	19	1.06	−0.82	4.92	1880	0.23	1873
Connecticut.									
Middletown	Middlesex	5.44	27	5.12	−0.32	10.22	1867	1.16	1865
Florida.									
Merritt's Island	Brevard	6.57	11	6.95	+0.38	15.77	1880	1.15	1883
Georgia.									
Forsyth	Monroe	4.76	15	5.50	+0.74	7.46	1879	2.50	1888
Illinois.									
Peoria	Peoria	3.12	33	1.23	−1.89	9.04	1862	0.57	1883
Riley	McHenry	4.11	38	0.77	−3.34	15.73	1850	0.77	1889
Indiana.									
Logansport	Cass	3.21	15	1.67	−1.54	6.30	1886	0.67	1881
Vevay	Switzerland	3.38	24	0.02	−3.36	10.90	1879	0.02	1889
Iowa.									
Cresco	Howard	3.32	16	0.92	−2.40	8.34	1884	0.92	1889
Monticello	Jones	3.98	24	0.22	−3.76	8.54	1885	0.22	1889
Logan	Harrison	4.52	22	3.14	−1.38	8.40	1873	0.80	1882
Kansas.									
Lawrence	Douglas	3.57	24	8.38	+4.81	9.07	1888	0.09	1882
Wellington	Sumner	2.92	10	3.91	+0.99	5.15	1888	0.61	1885
Louisiana.									
Grand Coteau	St. Landry	3.54	6	5.13	+1.59	8.07	1888	0.42	1883
Maine.									
Gardiner	Kennebec	3.65	49	†	.....	8.49	1867	0.19	1876
Maryland.									
Cumberland	Allegany	3.15	18	1.52	−1.63	8.09	1882	0.31	1881
Massachusetts.									
Amherst	Hampshire	4.43	53	3.16	−1.27	12.13	1856	0.25	1882
Newburyport	Essex	3.60	11	2.89	−0.71	7.57	1887	0.75	1883
Somerset	Bristol	4.17	17	6.19	+2.02	8.08	1880	0.58	1882
Michigan.									
Kalamazoo	Kalamazoo	2.86	13	0.31	−2.55	8.94	1885	0.31	1889
Thornville	Lapeer	3.23	12	0.35	−2.88	6.69	1877	0.35	1889
Minnesota.									
Minneapolis	Hennepin	3.85	23	2.39	−1.46	11.64	1869	0.47	1883
Montana.									
Fort Shaw	Lewis&Clarke	0.80	19	0.00	−0.80	3.01	1876	0.00	'71,'89
New Hampshire.									
Hanover	Grafton	3.71	44	1.78	−1.93	9.46	1849	0.12	1854
New Jersey.									
Moorestown	Burlington	4.59	26	5.50	+0.91	9.44	1882	0.81	1881
South Orange	Essex	5.37	18	4.69	−0.68	12.55	1875	1.10	1886
New York.									
Cooperstown	Otsego	3.87	35	2.13	−1.74	9.46	1856	0.63	1876
Palermo	Oswego	2.60	35	1.20	−1.40	6.40	1864	0.41	1866
North Carolina.									
Lenoir	Caldwell	5.77	17	4.20	−1.57	10.20	1886	2.10	1877
Ohio.									
N. Lewisburgh	Champaign	3.75	17	1.55	−2.20	7.55	1882,'85	0.80	1884
Wauseon	Fulton	2.88	17	1.54	−1.34	4.86	1886	1.12	1884
Oregon.									
Albany	Linn	0.44	10	1.18	+0.74	1.62	1881	0.00	'85,'88
Eola	Polk	0.38	20	1.39	+1.01	1.81	1879	0.00	*
Pennsylvania.									
Dyberry	Wayne	3.76	17	2.85	−0.91	8.77	1885	0.95	1883
Grampian Hills	Clearfield	4.25	19	4.00	−0.25	8.19	1888	1.66	1883
Wellsborough	Tioga	5.55	10	0.83	−4.72	15.25	1885	0.83	1889
South Carolina.									
Statesburgh	Sumter	3.65	8	7.05	+3.40	7.05	1889	2.12	1886
Tennessee.									
Austin	Wilson	3.70	20	3.01	−0.69	7.80	1871	0.50	1881
Milan	Gibson	4.38	6	1.43	−2.95	10.00	1888	0.72	1885
Texas.									
New Ulm	Austin	3.12	17	3.33	+0.21	8.38	1878	0.09	1885
Vermont.									
Strafford	Orange	3.52	16	2.00	−1.52	7.90	1885	1.40	1882
Virginia.									
Bird's Nest	Northampton	4.61	20	4.05	−0.56	11.25	1875	0.20	1869
Wytheville	Wythe	3.41	24	5.59	+2.18	7.65	1882	1.38	1884
Wisconsin.									
Madison	Dane	3.37	18	0.72	−2.65	6.83	1882	0.56	1881
Washington.									
Fort Townsend	Jefferson	0.80	15	1.34	+0.54	2.12	1879	0.00	1885

*Frequently. †Report not received.

The above table shows that at Riley, Ill., thirty-eight years record, Vevay, Ind., twenty-four years record, Cresco, Iowa, sixteen years record, Monticello, Iowa, twenty-four years record, Kalamazoo, Mich., thirteen years record, Thornville, Mich., twelve years record, and Wellsborough, Pa., ten years record, the precipitation for the current month was the least, and that at Statesburgh, S. C., eight years record, it was the greatest noted for August during the periods of observation.

EXCESSIVE PRECIPITATION.

Monthly precipitation to equal or exceed ten inches was reported at three stations in Florida and Georgia; at two stations in South Carolina, and at one station in Massachusetts, Wisconsin, and Nebraska. In states and territories other than those named precipitation to equal or exceed ten inches was not reported for August, 1889. The heaviest rainfalls in

the states named were: 14.02 at Live Oak, Fla.; 15.56 at Diamond, Ga.; 14.89 at Florence, S. C.; 11.05 at Nantucket, Mass.; 14.89 at Grantsburgh, Wis., and 11.58 at Weston, Nebr. In August of preceding years rainfall to equal or exceed ten inches has occurred most frequently in Florida, where it was reported for thirty years; in Georgia for twenty-one years; in South Carolina for nineteen years; in Alabama and North Carolina for sixteen years; in Iowa, Louisiana, New Jersey, New York, Texas, and Virginia for from ten to fifteen years, inclusive; in Connecticut, Illinois, Indiana, Kansas, Maryland, Massachusetts, New Hampshire, Ohio, and Pennsylvania for from five to nine years, inclusive; in Arizona, Arkansas, Colorado, Dakota, Delaware, District of Columbia, Indian Territory, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Mexico, Tennessee, Vermont, West Virginia, and Wisconsin for from one to four years, inclusive. In states and territories other than those named monthly precipitation to equal or exceed ten inches has not been reported for August in preceding years. Among notable monthly rainfalls for August are: Fort Brooke, Fla., 23.40, in 1840; Fairview, Fla., 21.35, in 1871; New Smyrna, Fla., 23.00, in 1871; Saint Augustine, Fla., 21.50, in 1871; Newport, Fla., 23.25, in 1872; Fort Barrancas, Fla., 30.73, in 1878, and 25.07, in 1879; Savannah, Ga., 20.37, in 1841; Charleston, Ill., 23.04, in 1882; Maurepas and New Orleans, La., 23.44 and 22.74, respectively, in 1888; Newark, N. J., 22.48, in 1843; Elsworth, N. C., 28.33, in 1880; Asheville and Tarborough, N. C., 28.65 and 22.73, respectively, in 1887; Fort Moultrie, S. C., 24.42, in 1859; U. S. Naval Hospital, near Portsmouth, Va., 23.75, in 1867. Exclusive of the instances cited, monthly precipitation to equal or exceed fifteen inches has been reported for six years in Florida; for four years in South Carolina and Texas; for three years in Georgia; for two years in Connecticut, Indiana, Louisiana, Michigan, New York, Pennsylvania, and Virginia; and for one year in Alabama, Illinois, Iowa, Kansas, Massachusetts, Mississippi, Nebraska, New Hampshire, New Jersey, North Carolina, Ohio, Tennessee, and Wisconsin.

Precipitation to equal or exceed 2.50 inches in twenty-four hours was reported at the greatest number of stations, sixteen, in Kansas; at five in Florida and New Jersey, and at from one to four, inclusive, in Alabama, Arkansas, Connecticut, Dakota, Georgia, Illinois, Indiana, Indian Territory, Iowa, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and Wisconsin. In states and territories other than those named precipitation to equal or exceed 2.50 inches in twenty-four hours has not been reported for August, 1889. The heavier rainfalls for one day, by states, for the month were: 6.50, at Carson, Iowa, 9th; 9.00, at Tecumseh, Nebr., 12th; 5.35, at New Braunfels, Tex., 9th. At Nantucket, Mass., 5.73 fell on the 14th and 15th; at Oceanic, N. J., 5.78 on the 13th and 14th, and at Grantsburgh, Wis., 7.75 on the 19th and 20th. Precipitation to equal or exceed 2.50 inches in twenty-fours in August has been reported most frequently in Pennsylvania, where it has been noted for eighteen years; in Georgia, South Carolina, and Texas for seventeen years; in Missouri for sixteen years; in Alabama, Connecticut, Dakota, Florida, Illinois, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Mississippi, New Jersey, New York, North Carolina, Ohio, and Tennessee for from ten to fifteen years, inclusive; in Delaware, Indiana, Louisiana, Maryland, Nebraska, New Hampshire, Virginia, West Virginia, and Wisconsin for from five to nine years, inclusive; and in Arizona, Indian Territory, Kentucky, Maine, Montana, Rhode Island, and Vermont for from one to four years, inclusive. In states and territories other than those named precipitation to equal or exceed 2.50 inches in twenty-four hours has not been reported for August of preceding years. Among the heavier daily rainfalls noted for August are: Fort Barrancas, Fla., 9.75, 29th, 1878; Griffin, Ga., 10.38, 8th, 1883; Mandeville, La., 8.54, 8th, 1888; New Orleans, La., 8.90, 20th, 1888; Cape May, N. J., 8.46, 18th, 1879; Elsworth, N. C., 9.00, 4th, 1880; Hatteras, N. C., 9.14, 23d, 1880; Kitty Hawk, N. C., 8.14, 15th, 1883, Granbury, Tex., 10.15, 26th, 1888, and Johnstown, Va., 7.70, 18th, 1879. Exclusive of the instances and years cited, rainfall to equal or exceed 5.00 inches in twenty-four hours has been reported in North Carolina for six years; in Illinois and South Carolina for four years; in Massachusetts for three years; in Alabama, Kansas, and Virginia for two years; and in Connecticut, Dakota, Florida, Iowa, Maine, Maryland, Missouri, Nebraska, New Jersey, New York, Pennsylvania, Tennessee, and Texas for one year.

Rainfall to equal or exceed the rate of one inch an hour occurred on five dates in Kansas; four dates in Georgia; three dates in Wisconsin; two dates in Alabama, Florida, South Carolina, and Texas; and one date in Colorado, Dakota, District of Columbia, Iowa, Louisiana, Maryland, Mississippi, Nebraska, New York, Ohio, Pennsylvania, and Virginia. In states and territories other than those named rainfalls to equal or exceed the rate of one inch an hour have not been reported for August, 1889. Among the heavier rainfalls reported for one hour or less are: Grantsburgh, Wis., 1.88 in thirty minutes, 7th; and Marietta, Ga., 1.57 in thirty-five minutes, 13th. At Carson, Iowa, 6.50 in four hours, 9th. In August of preceding years rainfalls to equal or exceed this amount in the period given have been most frequently reported in Texas, where they have been noted for fourteen years; in Pennsylvania for thirteen years; in Kansas and Tennessee for twelve years; in Florida, Georgia, and Missouri for eleven years; in Dakota, Illinois, Indiana, Iowa, Maryland, Michigan, Mississippi, Nebraska, New York, North Carolina, Ohio, South Carolina, and Virginia for from five to ten years, inclusive; and in Alabama, Arizona, Arkansas, Colorado, Connecticut, Delaware, Indian Territory, Kentucky, Louisiana, Maine, Massachusetts, Minnesota, Montana, New Hampshire, New Jersey, New Mexico, and Rhode Island for from one to four years, inclusive. In states and territories other than those named rainfalls to equal or exceed the rate of one inch an hour have not been reported for August. Among the heavier rainfalls reported for one hour or less in August are: For five minutes: New York City, 0.45, 5th, 1884; and 0.43, 18th, 1887. For ten minutes: Salisbury, N. C., 0.50, 13th, 1888; Norfolk, Va., 2.48, 20th, 1888; New York City, 0.59, 4th, 1888; and 0.40, 21st 1888. For fifteen minutes: Osage, Iowa, 1.40, 26th, 1881; Saint Louis, Mo., 5.05, 15th, 1848; Mesquite, Tex., 2.12, 11th, 1875. For eighteen minutes: Lead Hill, Ark., 1.00, 2d, 1882. For twenty minutes: Escanaba, Mich., 1.27, 11th, 1877; Albany, N. Y., 1.25, 2d, 1878. For twenty-three minutes: Louisville, Ky., 1.26, 20th, 1878. For twenty-five minutes: Galveston, Tex., 1.55, 17th, 1871; Indianola, Tex., 1.33, 18th, 1882. For thirty minutes: Fort Ellis, Mont., 1.50, 10th, 1883; Mount Auburn, Ohio, 1.52, 26th, 1880; Wellsborough, Pa, 1.95, 21st, 1885; Mesquite, Tex., 2.50, 10th, 1875; Vevay, Ind., 1.90, 13th, 1879. For thirty-five minutes: Auburn, N. H., 3.00, 27th, 1877; Hulmeville, Pa., 2.20, 25th, 1880; Pittsburgh, Pa., 1.85, 16th, 1884; Cincinnati, Ohio, 1.85, 27th, 1882. For thirty-six minutes: Providence, R. I., 3.50, 6th, 1878. For forty-one minutes: Jacksonville, Fla., 3.72, 20th, 1873. For forty-five minutes: Detroit, Mich., 2.48, 31st, 1878. For fifty minutes: Fort Delaware, Del., 3.00, 31st, 1868; Fort Union, N. Mex., 2.34, 12th, 1883.

Table of excessive precipitation, August, 1889.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Alabama.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Montgomery		2.72	14-15	1.08	0 30	4
Do				1.60	0 45	15
Arkansas.						
Devall's Bluff		3.60	4			
Lead Hill		2.90	4			
Newport (1)		4.30	4			
Newport (2)		3.99	4			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Colorado.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Pueblo				1.04	1 02	9
Connecticut.						
Wallingford		2.92	1			
Dakota.						
Alexandria		2.75	18			
Yankton				1.46	1 02	12
District of Columbia.						
Washington City				1.05	1 00	6
Florida.						
Alva	11.78	2.57	23			
Archer				2.09	1 00	13
Fort Barrancas		3.00	29-30			
Kissimmee City	13.03					
Lake City		3.01	31			
Live Oak	14.02	2.99	29			
Pensacola		2.91	30			
Villa City				1.28	0 35	20
Georgia.						
Andersonville				2.04	2 00	22
Atlanta				1.10	1 00	5
Augusta		3.32	4			
Diamond	15.56	3.33	24-25			
Do		2.70	27-28			
Fort McPherson	10.85					
Hephzibah		2.90	11-12			
Marietta				1.57	0 35	13
Point Peter				1.20	1 00	13
Savannah		2.60	6	2.20	1 00	6
Toccoa	10.17					
Illinois.						
Palestine		2.60	9			
Indiana.						
Lafayette		3.36	9			
Indian Territory.						
Fort Reno		2.54	16			
Healdton		3.45	16			
Iowa.						
Carson		6.50	9	6.50	4 00	9
Kansas.						
Augusta		3.00	20			
Bendena				2.25	1 20	12
Brookville		2.50	11			
Ellis (1)		2.50	10			
Ellis (2)		2.50	3	2.50	1 35	3
Englewood				2.00	2 00	3
Fort Hays				1.05	1 00	3
Fort Leavenworth (1)				2.20	1 40	12
Fort Leavenworth (2)		3.00	13			
Fort Riley		3.00	10-11			
Grenola		3.00	10			
Haven		2.75	10			
Horton				2.44	1 15	12
Lawrence		4.00	12			
Leavenworth		3.38	12-13	1.05	0 45	9
Do				1.91	1 25	12
Do				1.10	0 45	13
Morse				2.00	1 30	12
Ogallah		2.50	9			
Ottawa		2.70	12-13			
Rago		2.75	20			
Rome				2.30	2 00	11
Sharon Springs		2.50	10			
Topeka		3.67	9-10			
Wichita		2.87	2c-21			
Winfield		2.50	10-11			
Yorkville		2.50	11			
Louisiana.						
Grand Coteau		2.75	15	2.75	1 30	15
Mandeville		2.52	5			
Plaquemine		3.00	22			
Maryland.						
Gambrill's		2.70	10	2.13	2 00	23
Massachusetts.						
Framingham		2.50	14			
Gilbertville		2.90	14			
Nantucket	11.05	5.73	14-15			
Provincetown				2.00	1 00	3
Taunton (1)		2.67	3			
Minnesota.						
Duluth		2.76	19-20			
Mississippi.						
Logtown		2.55	15	1.65	0 30	9
Pearlington		2.55	15	2.55	1 00	15
University		3.12	31			
Missouri.						
Oak Ridge		2.50	10			
Nebraska.						
Brownville		2.94	12			
Crete		4.35	11-12			
Hay Springs				2.23	2 05	10
Tecumseh		9.00	12			
Weeping Water		5.25	9			
Weston	11.58					
New Jersey.						
Asbury Park		2.60	1			
Ocean City		3.00	23			
Oceanic		5.78	13-14			
Rancocas		2.50	14			
Tenafly		2.75	13-14			

Toble of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
New York.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Watervliet Arsenal				1.25	0 40	2
White Plains		2.95	14			
North Carolina.						
Clarkton		2.50	27			
Hatteras		2.87	3			
Lumberton		5.19	26			
Wadesborough		2.50	7			
Ohio.						
Bellevue				1.05	0 40	2
Garrettsville				2.07	0 55	2
Sidney		2.92	10			
Vienna				1.32	0 55	2
Pennsylvania.						
Easton		2.99	13-14			
Grampian Hills		2.77	13-14			
Philadelphia		2.78	13-14	1.15	0 40	14
South Carolina.						
Cedar Springs				1.77	1 00	3
Cheraw	10.01					
Charleston		4.08	14-15	2.56	1 00	14
Florence	11.89	3.13	12			
Do		3.20	26			
Tennessee.						
Ashwood		2.60	11			
Texas.						
Corpus Christi				1.12	1 05	19
Fort Brown				1.30	1 00	3
La Grange		3.29	9			
New Braunfels		5.35	9			
Virginia.						
Norfolk				1.46	1 10	11
Spottsville		3.40	27-28			
Wisconsin.						
Glasgow				2.27	2 00	18
Grantsburgh	14.89	7.75	19-20	1.88	0 30	7
Do				1.07	1 00	15

Excessive precipitation for July, 1889, received too late for publication.

Arkansas.						
Dardanelle		5.00	29			
Connecticut.						
Hartford (1)	10.79					
Iowa.						
Denmark		4.42	17	4.42	2 45	17
Kansas.						
Concordia (near)		4.25	22-23			
Pennsylvania.						
Bethlehem		2.72	31			
Coatsville		3.02	30			
Do		2.80	31			
Doylestown		3.18	19			
Forks of Neshaminy		4.09	31			
Frederick		4.60	31			
Germantown		3.44	31			
Hollidaysburgh		2.83	2			
Lansdale		2.63	4			
Do		3.50	19			
Do		3.35	31			
Ottsville		2.79	19			
Do		2.60	30			
Point Pleasant		3.95	20			
Scisholtzville		3.06	31			
Smith's Corners		4.36	20			
Do		3.17	31			
Swarthmore		2.68	31			
Tennessee.						
Hohenwald		3.40	13			
Nunnelly		3.25	13			
Waynesborough		4.94	12			
Texas.						
Fort Worth	14.01	6.20	3			
Mexico.						
La Logia		3.55	6			
Topolobampo		2.50	26			
Dutch Guiana, S. A.						
Burnside Coronie	10.56					

SNOW.

Greensburgh, Westmoreland Co., Pa., 15th: the vicinity of Mammoth, this county, was visited by a snow storm shortly after daylight this morning. Snow fell in sufficient quantity to cover the ground.—*Ledger and Transcript, Phila., Pa.*, 16.

HAIL.

Descriptions of the more severe hail-storms of the month are given under "Local storms." Hail was reported during the month as follows: 2d, N. Y., Ohio. 3d, Ind., Kans., Mass., Va. 4th, Ind., N. Mex., Ohio. 5th, La. 6th, Kans. 7th, Dak., Me., Mass., Minn., Nebr., N. H. 8th, Minn., Wis. 9th Colo,. 10th, N. Y. 11th, Mont. 12th, Dak. 13th, Ariz. 14th, Minn.,

Ohio. 15th, Iowa, Nev. 16th, Colo., Idaho. 18th, Minn., Oregon, Wis. 19th, Colo., Dak. 22d, Ga. 23d, N. J., Va. 24th, Ohio. 25th, Ga., Minn. 27th, Mont. 28th, La. 29th, Ariz., Utah.

MAXIMUM RAINFALLS IN ONE HOUR OR LESS.

The table shows that the greatest rate per minute for a five minute period was .09 of an inch at Savannah, Ga., on the 6th. The rate per minute for this period at the other stations given was, .07 at Jupiter, Fla., 17th, and at Washington City, 6th; .04 at New York City, 3d; .03 at Saint Louis, Mo., 14th; .024 at Dodge City, Kans., 3d; .02 at Boston, Mass., 5th; and .01 at Cincinnati, Ohio, 2d. The greatest rate per minute for a ten minute period was, .08, at Savannah, Ga., 6th and 8th; .06 at Washington City, 6th; .045 at Jupiter, Fla., 17th; .03 at New York City, 3d; .025 at Saint Louis, Mo., 14th; .02 at Boston, Mass., 1st; Dodge City, Kans., 3d, and .01 at Cincinnati, Ohio, 2d. The heaviest rainfall for one hour, 2.20 inches, was measured at Savannah, Ga., on the 6th; at Washington City, 1.05 fell in one hour on the 6th, while at the remaining stations given rainfall to equal or exceed one inch an hour was not registered.

The following table is a record of the heaviest rainfalls during August, 1889, for periods of five and ten minutes and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		*Inch.*		*Inch.*	
Boston, Mass	0.10	5	0.20	1	0.25	1
Cincinnati, Ohio	0.05	2	0.07	2	0.10	2
Chicago, Ill	.....	.....	.....	.....	0.10	8, 13
Detroit, Mich	.....	.....	.....	.....	0.19*	9
Dodge City, Kans	0.12	3	0.21	3	0.45	3
Jupiter, Fla	0.35	17	0.45	17	0.60	17
New York City	0.20	3	0.30	3	0.55	3
Savannah, Ga	0.45	6	0.80	6, 8	2.20	6
San Francisco, Cal	.....	.....	.....	.....	T.*	.....
Saint Louis, Mo	0.15	14	0.25	14	0.47	14
Washington City	0.35	6	0.60	6	1.05	6

*Total for month.

WINDS.

The prevailing winds during August, 1889, are shown on chart ii by arrows flying with the wind. In New England, the middle Atlantic states, and the Lake region, south to west winds were most frequently noted; over the Florida Peninsula, the west Gulf states, and the southeastern slope of the Rocky Mountains, south to east winds prevailed; in the east Gulf states they were mostly from northeast to east; in the upper Mississippi valley, southeast to southwest; in the extreme Northwest, and on the middle-eastern slope of the Rocky Mountains, south to southeast; over the northern plateau region, and along the north and south Pacific coast, north to west; on the middle Pacific coast, northwest to southwest on the immediate coast, and southeast in the Sacramento Valley; in the south Atlantic states, the Ohio Valley and Tennessee, the northeastern slope of the Rocky Mountains, and the middle and southern plateau regions, variable.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour, other than those given in the table of miscellaneous meteorological data, were reported as follows: Valentine, Nebr., 54, s., 31st; Winnemucca, Nev., 52, sw., 17th.

LOCAL STORMS.

Severe storms were most frequently reported in Kansas and Minnesota, where they were noted for five dates; in New York for four dates; in Pennsylvania for three dates; in North Carolina, New Jersey, Georgia, Indiana, Nebraska, Dakota, Colorado, Missouri, Illinois, and West Virginia for two dates; and in Connecticut, Virginia, Maine, Massachusetts, Mississippi, Wisconsin, Alabama, Iowa, New Mexico, Tennessee, South Carolina, Utah, and California for one date. In states and territories other than those named no severe storms have been reported. They were reported in the greatest number of states, six, on the 14th; in five on the 13th; in four on the 3d and 7th; in three on the 1st and 4th; in two on the 2d, 5th, 6th, 9th, 12th, 15th, 17th, 19th, and 20th; and in one on the 10th, 16th, 18th, 22d, 23d, 25th, and 26th. The following are descriptions of the storms referred to:

1st. *Connecticut.*—Wallingford: a rain storm began during the early morning and continued until after 7 a. m. The water in Northrup's brook rose at an alarming rate and by 8 a. m. it was higher than ever known before. The Quinnipiack River also rose rapidly and the manufacturing establishments had to stop operations on account of the high water.—*The Palladium, New Haven, Conn., August* 2. Middletown: the severe rain storm during the day was the heaviest ever known in this section. The Connecticut River has been rising rapidly and a large amount of wreckage has been floating down the stream. The city sewers have overflowed and a number of houses have been flooded. All of the factories have shut down.—*Boston, Mass., Daily Globe, August* 1. *North Carolina.*—Soapstone Mount: a severe thunder and rain storm passed over this place between 4.20 p. m. and 5.30 p. m.; in this section several persons were shocked and one person was killed by lightning.—*Report of Mr. H. L. Kimrey. Virginia.*—Richmond: a storm broke over this city about 12.30 a. m., during which the city railway stables were struck by lightning.—*Democrat and Chronicle, Rochester, N. Y., August* 2. Danville: heavy rain prevailed during the day and the Dan River was higher than ever known before. Factories and small dwellings on the river banks were flooded and two bridges and one long trestle have been carried away. The loss is estimated at $15,000, exclusive of damage to railroads.—*Union and Advertiser, Rochester, N. Y., August* 2.

2d. *New Jersey.*—Elizabeth: during a heavy thunder-storm this morning lightning struck and ignited the Mammoth Pottery Works. The damage done is estimated at $35,000.—*Herald, Rochester, N. Y., August* 3. *New York.*—Albany: heavy peals of thunder were heard early in the morning, but, outside of west Albany, no rain fell in the city, although in the immediate vicinity the storm was very severe. The storm did great damage in west Troy. The heavy rain overflowed Dry River, which passes through the city, and cellars and portions of streets were flooded, causing several thousand dollars damage. Mannville, a small hamlet in the western part of West Troy, is inundated. The water on the lowlands is two feet deep in many places, and the damage to property is considerable. The New York Central Railway has been washed out in many places in this section.—*The Argus, Albany, N. Y., August* 3. Troy: a heavy rain-storm, accompanied by high winds and lightning, passed over this city this afternoon, flooding the streets and doing other damage. A part of the new canal culvert at 31st street was carried away.—*Herald, Rochester, N. Y., August* 3. Watkins, Schuyler Co.: a very destructive storm passed over this valley, in a narrow belt, during the afternoon. The lower half of Watkins Glen was flooded and several bridges were washed away. The damage will reach several thousand dollars. Much damage was also done to railroads and railroad bridges in this section.—*Oswego, N. Y., Daily Times, August* 2.

3d. *Kansas.*—Concordia: a thunder-storm, moving from northwest to southeast, occurred between 6.30 and 7.20 p. m. About six miles west of this city the storm was accompanied by hail, which extended over an area about three miles in